BRULE RIVER STATE FOREST MASTER PLAN
FACT SHEET

Water Resources

The Brule River is the central water resource of the Brule River State Forest. The river has been noted as a premier recreational stream since the late nineteenth century, providing canoeing and trout fishing. The State Forest forms a corridor the entire length of the stream, and includes several tributary streams and lakes.

The basin watershed to Lake Superior is about 180 square miles. The River is 45 miles long from its source to the mouth of Lake Superior. The upper half of the watershed lies in rolling sand hill topography of the Bayfield Sand Barrens and the lower half runs through the red clay soils of the Lake Superior Clay Plain. The soils within the watershed influence both the water quality and water quantity in streams, and the difference is evident in the upper and lower watersheds. The sand soils permit rapid infiltration of precipitation and ready movement of groundwater that provides the relatively stable base flow of the upper watershed. The clay soils have low permeability, causing rapid surface runoff of precipitation and high flow rates during short durations. The topography in the Clay Plain is characterized by numerous wetlands and drainages forming narrow, steep sided valleys. The rapid runoff characteristic of the soils cause regularly occurring peaking flows which accelerate erosion and cause instream turbidity in the lower reach.

Other Stream Resources of the Brule River Watershed

There are 165 miles of stream length in the Brule River watershed, with approximately 74 named and unnamed streams and sub-tributaries. Many of these are tributary to the Brule River and affect its overall quality.

Lake Resources

Five small lakes lie within the BRSF. Hoodoo, Rush, Smith, Gilbert, and Mills lakes are small soft water seepage lakes.

Other lakes within the Brule River Watershed include Lake Minnesuing, Gander, Shoberg, Cheney, Whisky, Sunfish, Deer, Lake Nebagamon, Twin Lakes, Steele, Little Steele, Minnow, Carrol, and Pine. These lakes are small with the exception of Lake Minnesuing, and Lake Nebagamon, which have major lakeshore development.

Water Quality of the Brule River

The Brule is known for its excellent water quality. WATER QUALITY can have many definitions and one way to define it is by the method in which it is monitored and measured. The measurements may include WATER CHEMISTRY such as nutrients, PHYSICAL MEASUREMENTS such as temperature and flow, and BIOLOGICAL ASSESSEMENT such as stream invertebrates and fish population monitoring.

In Wisconsin, most water quality monitoring is planned around achieving and maintaining Water Quality Standards, which are designed to support various designated uses. The majority of Monitoring is focused on waters with indications of problem conditions, with the goal to identify and correct the cause of the problems and bring the stream up to its designated use.

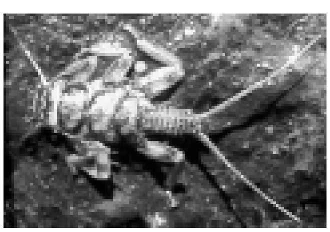
Water Chemistry Monitoring

WATER CHEMISTRY can be a quick and simple screening for major problems. However, because water chemistry is a "snapshot" condition of the water at the moment it is collected, many samples are needed taken over time to show average or trend conditions. The Brule has an extensive historical sampling base for water chemistry for a period from 1973 – 1994. The data show very consistent values and indicate good water chemistry. The most variable parameter appears to be Suspended Solids, an indicator of sediment. The sample site is at Highway 13, and indicates the effects of the Clay Plain hydrology. Even this parameter is relatively low and of good quality for flowing water. Dissolved oxygen consistently runs near 100% saturation, indicating no effects from organic pollutant loading. In summary, these long-term water chemistry data indicate consistently good water quality.

PHYSICAL MONITORING is done concurrent with chemical and biological monitoring. Temperatures support the trout steam classification. Stream level or flow, provides a stable base flow in the upper watershed, important to the seasonal life stages of trout. In the lower watershed flow is more variable and related to runoff events.

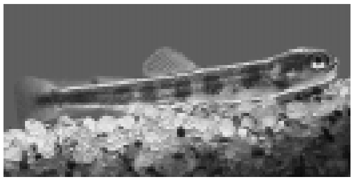
Biological Monitoring

Biological monitoring is perhaps one of the best overall monitoring methods, as this kind of monitoring integrates stream conditions over the life cycle of fish or invertebrates. An aquatic organism can survive and be present only if its most critical life cycle conditions are met all of the time.



Invertebrate Monitoring

Stream insects, or macroinvertebrates, have been used as indicators of water quality for organic pollution. Insects most sensitive to the effects of pollution are termed "intolerant organisms", as they can not survive the effects of even small additions of organic pollution. Stream water quality can be measured based on the health of the aquatic insect community. A commonly used index tool is the Hilsenhoff Biotic Index (HBI), which assigns a tolerance value, ranging from zero to 10 for individual species, with zero as the highest quality value. In a 1983-84 HBI study of the Brule River from 15 areas throughout the river system, all sites fell within the "excellent" range, indicating no apparent organic pollution. The study found 21 species of aquatic macroinvertebrates with an HBI tolerance value of zero, indicating exceptional water quality based on the aquatic insect community.



Fish Monitoring

Fish are also a measure of stream quality, and in the case of a healthy Class 1 Trout Stream, indicate continuous high quality conditions that sustain a healthy and reproducing population of a “pollution intolerant fish community.” Brook trout are a very good indicator of coldwater ecosystem health. Their reproductive needs are more easily impaired by watershed perturbations than other salmonids. Brook trout provide a good barometer of watershed quality. The brook trout population of the Brule River most closely resembles its original condition and is the healthiest of streams in the Wisconsin Lake Superior Drainage. A separate Factsheet discusses the fish and fishery of the Brule River.

Each of the three monitoring methods - CHEMICAL, PHYSICAL, AND BIOLOGICAL- indicate excellent water quality with good physical conditions, good water chemistry, and an exceptional high quality fish and invertebrate community. Overall, the base of monitoring data indicates the water quality of the Brule River is in excellent condition.

Threats to Water Quality of the Brule River

The Brule River is surrounded by the BRSF. However, of the total watershed size of 180 square miles, about 81 square miles, or 45 percent of the watershed is within the State Forest boundaries. And of that 62.5 sq. miles are in state ownership, which leaves about 65% of the total watershed outside of direct state ownership and management. Threats to water quality are commonly categorized into Point Source and Nonpoints of source pollution. In the Brule watershed, Nonpoint source pollutants represent the biggest source and threat of pollution.

Point Sources are defined within the state water quality programs as those regulated under a Wisconsin Pollution Discharge Elimination System Permit (WPDES Permit). There are three WPDES dischargers in the watershed.

FACILITY NAME	PERMIT # EXP. DATE	RECEIVING WATER	CLASS	ACTIVITIES
WDNR Brule Fish Hatchery	0004171 03/31/95	Little Brule River and Groundwater	ORW	Fish Hatchery
Brule Sanitary District No. 1	0061158 03/31/98	Groundwater		Municipal
Lake Nebagamon	0031429 06/30/96	Groundwater		Municipal

Nonpoint pollution includes any source that is not a permitted discharge. In the Brule River watershed, this includes street runoff, private waste disposal systems, construction and development runoff, roadside and ditch runoff, and land use practices such as agriculture and forestry. Any land use activity that increases runoff can carry additional nutrients and sediments to the stream.

For the upper watershed, the highly permeable sand soils and predominant pattern of public land ownership and forest cover greatly limit the potential for Nonpoint Source pollution. Nonpoint pollution is closely associated with overland runoff.

For the lower half of the watershed, Nonpoint pollution may be the primary threat to water quality. The clay soils reduce infiltration into the ground, village and rural development is present, and most of the land is outside of the stream corridor and is in private ownership and outside and beyond regulation or protection from Department land management activities.

A primary threat to the lower watershed is simply too much water from too rapid a surface water runoff rate. Runoff rates are increased by land use and development practices that disturb soil and vegetative cover. Activities that remove vegetative cover and reduce infiltration areas with impermeable surfaces magnify flow events in the lower watershed.

Examples include paved roads, driveways, and rooftop surfaces, road and ditch construction which alters drainage patterns, re-exposing raw soils from road and ditch maintenance, and altered infiltration and surface runoff patterns from agricultural and forest management practices may all contribute to accelerated runoff rates.

Water quality problems from increased peak flows include erosion, sedimentation, turbidity, scouring of desirable habitat, and particularly fluctuating water temperatures that can impact sensitive life-stages of fish.

Nonpoint source pollution is an influence to the water quality of the Brule, but is still not causing significant impairment to the aquatic resource base. However, continued protection and improvement may be possible with a watershed-wide protection plan involving all levels of agency, government, and public participation. Preventing and reducing nonpoint source pollution requires applying best management practices to all land use activities. A project similar to a Priority Watershed Project may be a way to focus on best management practices on each type of land use for the entire watershed and protect the water quality and water resources of the Brule River Watershed.